



Technical Bulletin / Fall 2011:

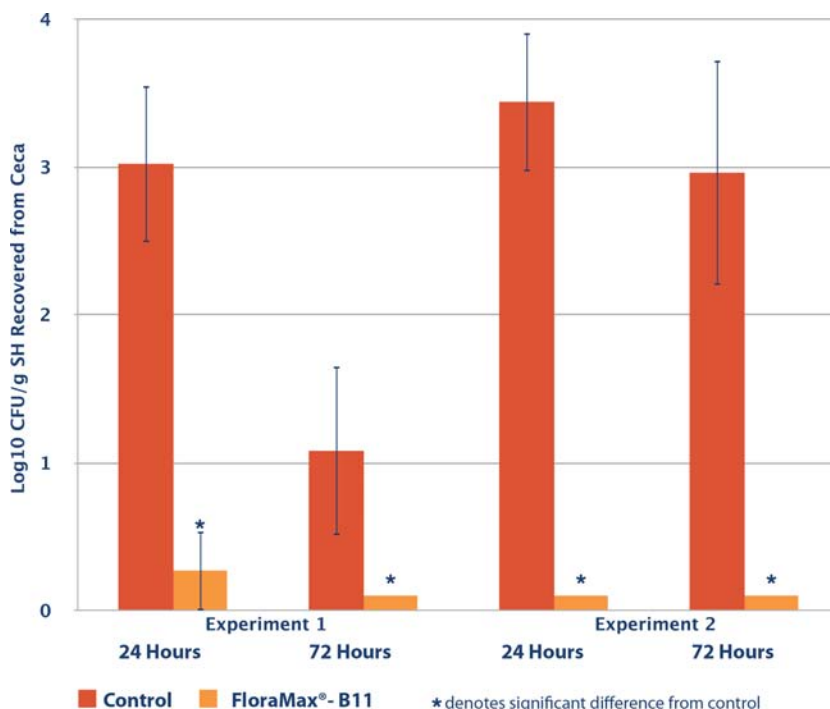
Control of *Salmonella* Heidelberg in Commercial Poultry

Historically, some strains of host-adapted *Salmonella* sp. have limited the ability of farmers to raise livestock and poultry intensively. With regard to poultry, *Salmonella* Pullorum and *Salmonella* Gallinarum were critical obstacles that prevented

expansion of poultry beyond their place as barnyard animals. As difficult as it must have seemed, pioneering poultry farmers of the early 20th century were able to control and ultimately eliminate these strains of *Salmonella* through purchase

of clean breeding stock, structured flock testing and judicious eradication of infected flocks. It seems most remarkable that these advances were made with simple technologies such as the “bird side” rapid whole blood agglutination test.

FloraMax®-B11 rapidly clears *S. Heidelberg* in broilers.



Effect of FloraMax®-B11 on Recovery of *Salmonella* Heidelberg from the Ceca of Broiler Chickens. 2011 Poultry Science 90:561-565.

As *Salmonella* Pullorum and *Salmonella* Gallinarum became historical diseases in the United States and Canada, other moderately-pathogenic (or perhaps apathogenic) *Salmonella* sp. appeared to become more prevalent. The conclusion of “increased prevalence” of *Salmonella* sp. is arguable, since culture and molecular detection methods have become much more sensitive. The use of Polymerase Chain Reaction (PCR) as well as advanced enrichment culture techniques and semi-solid media have clearly reduced the number of “false negative” cases. Also, data analysis of human illnesses and the use of molecular diagnostic methods have improved the ability of federal, state, and local health officials to identify and traceback potential foodborne outbreaks of human salmonellosis. It is certain that these most sensitive methodologies will ultimately become the standard.



Regulatory officials are typically slow to utilize new technologies in revising rules and expectations. When regulations were revised, the changes have been substantial, but infrequent, rather than moderate and regular. We appear to be in a period of impending, significant regulatory enhancement.

“Paratyphoid” *Salmonella* sp. serovars have been well recognized as causes of enteric disease in young turkey poults. Isolation of *Salmonella* sp. from inflamed yolk sacs of chicks and poults is also considered to be clinically significant. It is well recognized that some strains of *Salmonella* Enteritidis cause clinical disease including morbidity and mortality.

Salmonella Heidelberg has been recovered from poultry diagnostic and environmental samples for a significant period of time. While it is appropriate for diagnostic laboratory reports to document the detection of any *Salmonella* sp. (or other potentially pathogenic bacteria), the veterinarian caring for the flock is the only professional who can appropriately assign clinical significance to the isolate. Based on flock appearances, it is common for veterinarians to categorize detection of paratyphoid *Salmonella* sp. (including

Salmonella Heidelberg) as “commensal,” or possible “opportunistic secondary pathogens.”

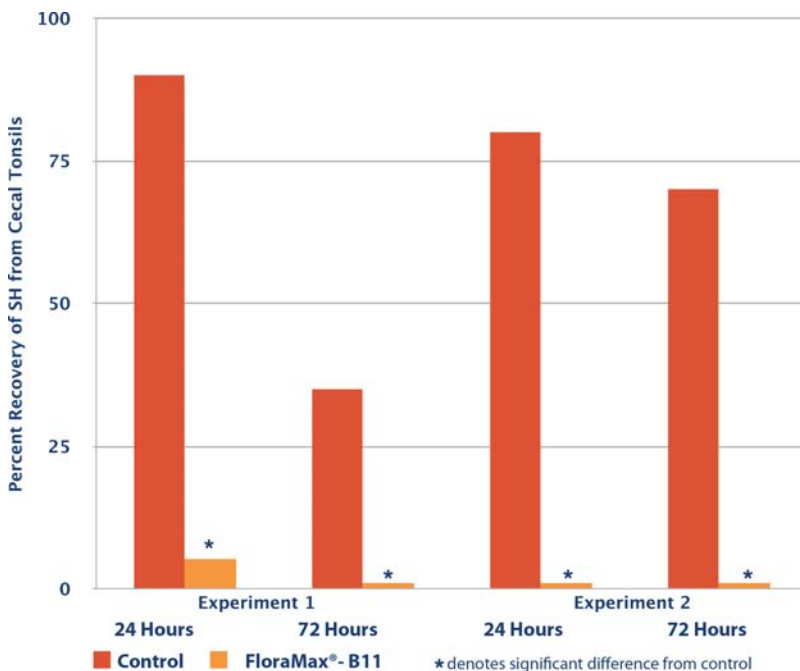
Poultry-associated *Salmonella* sp. has always been recognized as potential causes of human illness. However, it has been in laboratory settings, where the organism is amplified multiple log factors, where poor hygiene and/or poor laboratory practices has resulted in direct cases of human salmonellosis. This type of laboratory-caused human illness has been the recent subject of a “traceback” lead by the Center for Disease Control and Prevention (CDC).¹

In this case, human illnesses in multiple states were tied to a single *Salmonella* Typhimurium strain. Of course, it is possible to amplify *Salmonella* sp. to the point of reaching an infectious dose in food, through unintentional thermal mishandling. This is not a new phenomenon, but it has been the recent recipient of enhanced regulatory scrutiny.

Until recently, foodborne salmonellosis has only been detected when there was a localized

instance of the end-users mishandling poultry products, resulting in significant amplification of *Salmonella* sp. The possibility of “food poisoning” from consuming mishandled food has been a risk recognized by knowledgeable consumers for eons. Today, the CDC monitors human diagnostic samples from cases of *Salmonella*-associated gastroenteritis on an ongoing, somewhat clandestine basis.²

FloraMax®-B11 reduces *S. Heidelberg* colonization in broilers.



Effect of FloraMax®-B11 on Recovery of *Salmonella* Heidelberg from the Cecal Tonsils of Broiler Chickens. 2011 Poultry Science 90:561-565.

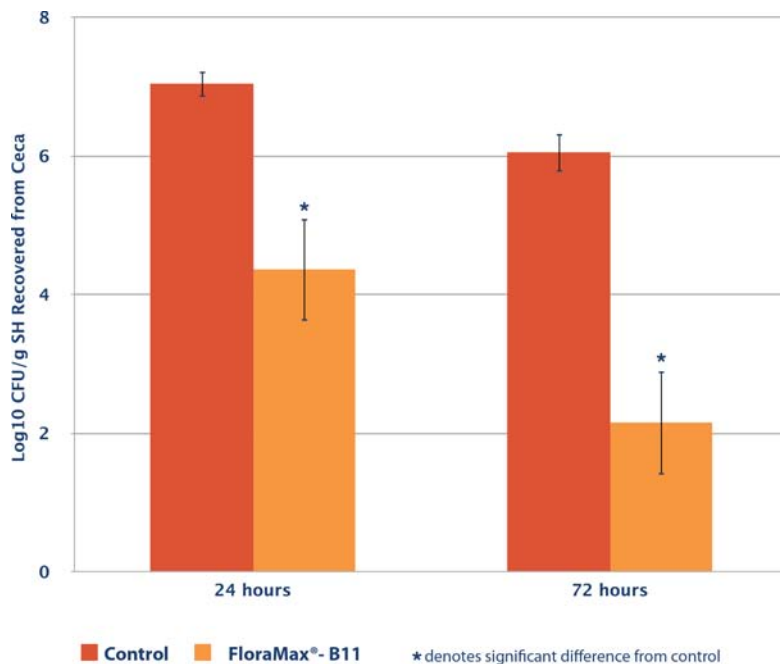


This process, along with the use of modern computer-assisted data analysis, allows for unrelated food handling mistakes to be aggregated based on Pulsed Field Gel Electrophoresis fingerprints. These data are used to “build” an outbreak from geographically separated individuals, not just from people who ate from the same communal dish. Without these advanced molecular and data mining techniques, most of the recent linkages would have gone unnoticed.

The CDC³ and the United States Department of Agriculture (USDA)⁴ maintain distinct lists of *Salmonella* serotypes isolated from human illnesses and animal processing tests, respectively. It is certain, despite scientific flaws in creating direct causal linkages between these bacterial populations, government officials, activists, and customers will assign high significance to serotypes common to food processing and human illness.

Salmonella Heidelberg has consistently been one of the “Top 5” serotypes detected in both human illnesses and poultry samples.

FloraMax[®]-B11 dramatically reduces *S. Heidelberg* colonization of the ceca in turkeys.
This trial showed a 99~99.99% reduction.



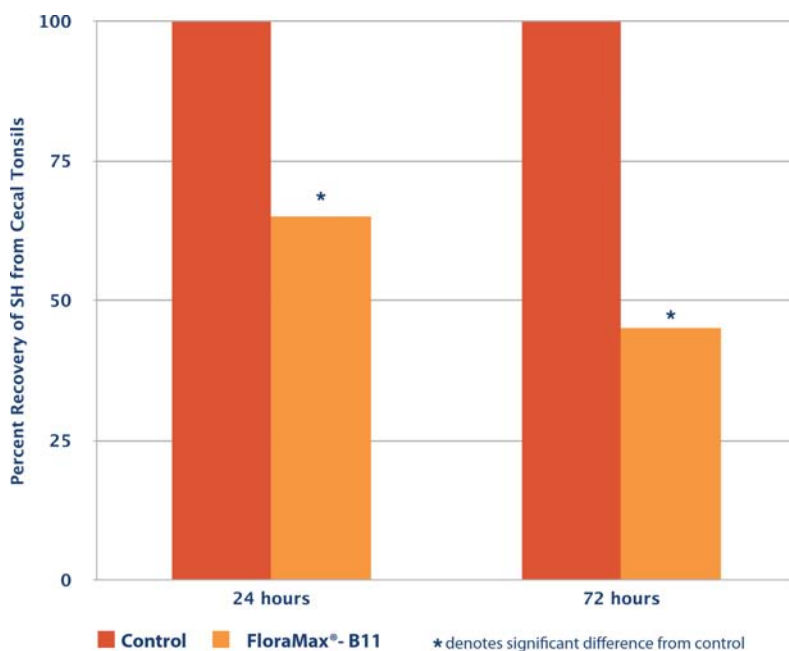
Effect of FloraMax[®]-B11 on Recovery of *Salmonella* Heidelberg from the Ceca of Turkey Poults. 2011 Poultry Science 90:561-565.

The discussion of the validity of assigning cause-and-effect significance to these associations is beyond the scope of this article. There are potential shortcomings to invariably blaming *Salmonella* found in poultry products for foodborne illness, however it is inevitable that government agencies and consumers will reach this conclusion. It should come as no surprise to progressive poultry producers that *Salmonella* Heidelberg has been noticed by regulatory officials. Accordingly, tracebacks of human *Salmonella* isolates to poultry products (and the plants or farms of origin) will lead to recalls and increased government scrutiny in the form of Food Safety Assessments (FSA). It is likely that the FSAs will lead to requests for documentation of on-farm *Salmonella* sp. detection, preventative measures, and responses to detection of *Salmonella* positive flocks. Based on previous experience with FSAs and HACCP plans, regulators will be looking for evidence these *Salmonella* control procedures have a scientific foundation. It is prudent to use select direct-fed microbials (DFMs) as part of a *Salmonella* control program. A limited number of DFMs have been evaluated in



laboratory and clinical settings in such a way as to demonstrate their effect in reducing the incidence of *Salmonella* sp. FloraMax® B-11 has been scientifically evaluated by university scientists for the ability to reduce the incidence of *Salmonella* Heidelberg in live chicks and turkey poults. In the absence of other data suggesting equal or superior efficacy in reducing the incidence of *Salmonella* Heidelberg, it seems likely FSIS will expect FloraMax® B-11 to be included in the on-farm component of a *Salmonella* Heidelberg intervention.

FloraMax®-B11 speeds clearance of *S. Heidelberg* from cecal tonsils.



Effect of FloraMax®-B11 on Recovery of *Salmonella* Heidelberg from the Cecal Tonsils of Turkey Poults. 2011 Poultry Science 90:561-565.

Although there are other methods of control that should be considered and included in a response to a USDA FSA, these methods have limitations.

Vaccination with *Salmonella* sp. bacterins has been well documented to be effective in displacing specific strains at the processing plant. Although effective, this methodology has the following shortcomings: 1) Other strains of *Salmonella* sp. may fill the newly open “niche” left by the vaccination strain. 2) There is a substantial “vaccination reaction” that occurs following the use of killed bacterins. This reaction is characterized by general flock malaise, drops in feed consumption, and infrequent mortality. This general malaise has often resulted in reduced productivity of vaccinated hen flocks. 3) Because these killed bacterins are most often used in breeder flocks, there is a substantial time lag from the onset of vaccination to the beginning of actual *Salmonella* sp. reduction at the processing plant.

Rodent control is a noble endeavor due to the pests’ detrimental effects on flock productivity, feed utilization, and housing condition. However, despite occasional documented case reports where rodents were the source of flock *Salmonella* sp. infection, rodents are only significant sources of *Salmonella* sp. in instances where farming operations are approaching “*Salmonella* Free” status. Accordingly, rodent control should continue to be emphasized and perhaps claimed as a component of *Salmonella* sp. control, but with the technical knowledge that the impact of rodent control is limited.



Breeder flock *Salmonella* sp. status has been accepted (since the times of endemic *Salmonella* Pullorum and *Salmonella* Gallinarum) as a key part of a *Salmonella* sp. control program. Today, breeder flock *Salmonella* sp. status is also applicable to paratyphoid *Salmonella* sp. control programs. The significance is evident in that primary poultry breeders have universally accepted this approach. Today, primary breeder flocks have an exceptionally low incidence of *Salmonella* sp. infection. In fact, all primary breeders are either entirely *Salmonella* sp. free, or they are fighting a longstanding battle with a very few paratyphoid serotypes. It is important to communicate to suppliers of breeding stock the expectation that chicks and poults will be free of *Salmonella* sp. on arrival. It is unlikely that, in today's market, primary breeders would deliver *Salmonella* sp. suspect or known positive chicks.

In light of today's heightened regulatory and consumer emphasis on *Salmonella* sp., including *Salmonella* Heidelberg, it is crucial that poultry producers have a robust control program that covers all potential areas of risk. This may be even more important since there is credible speculation that some *Salmonella* serotypes (like Heidelberg) are emerging as adapted human pathogens. Regardless, it is clear that the reliance on "traditional" control measures such as vaccination and rodent control has not been adequate. The addition of specific, scientifically proven probiotics cultures, such as FloraMax[®] B-11, should be incorporated into most, if not all *Salmonella* control programs.

References

¹ Investigation Announcement: Multistate Outbreak of Human *Salmonella* Typhimurium Infections Associated with Exposure to Clinical and Teaching Microbiology Laboratories
United States Department of Health and Human Services
Center for Disease Control and Prevention (CDC)
<http://www.cdc.gov/Salmonella/typhimurium-laboratory/042711/index.html>

² PulseNet
United States Department of Health and Human Services
Center for Disease Control and Prevention (CDC)
<http://www.cdc.gov/pulsenet/>

³ National *Salmonella* Surveillance Data
Salmonella Annual Summaries
United States Department of Health and Human Services
Center for Disease Control and Prevention (CDC)
<http://www.cdc.gov/ncidod/dbmd/phlisdata/Salmonella.htm>

⁴ Serotypes of *Salmonella* Isolates from Meat and Poultry Products
January 1998 Through December 2010
United States Department of Agriculture
Food Safety Inspection Service
http://www.fsis.usda.gov/PDF/Serotypes_Profile_Salmonella_2010.pdf

⁵ Effect of lactic acid bacteria probiotic culture for the treatment of *Salmonella* enteric serovar Heidelberg in neonatal broiler chickens and turkey poults. Menconi, A., et. al.
2011 Poultry Science 90:561-565